

ceeded in taking a very fine and extensive photograph of the nebula containing most of the delicate outlying parts which were not in my earlier photographs. This is in the hands of the photolithographer now and will shortly be published. The experiments have been very difficult because an exposure of more than two hours in the telescope has been necessary, and an exceedingly minute motion of the stars relative to the sensitive plate will become apparent on account of the high magnifying power (180) employed.

In carrying out the second object two contrivances have been used; first, a direct-vision prism in the cone of rays from the objective before they had reached a focus, and second the two-prism spectroscope with which I have taken photographs of stellar spectra for some years past.

During the month of March I have made two good photographs with each of these arrangements. Those with the direct-vision prism, without a slit, have of course demanded that the image should be kept stationary on the sensitive plate throughout the exposure, viz. two hours, and they are as difficult to get as good photographs of the nebula itself. On the contrary, those obtained with the slit spectroscope do not require the same steadfast attention.

The results derived from these photographs are interesting partly from what they show and partly from what they promise in the future. A number of photographs, under various conditions, will be needed for the full elucidation of the subject.

The most striking feature is perhaps the discovery of two condensed portions of the nebula just preceding the trapezium, which give a continuous spectrum. At those places there is either gas under great pressure or liquid or solid. I have not been able to detect any stars of sufficient magnitude in these portions to produce this effect either in my photographs of the nebula or in any of the well-known drawings of this object. It seems to me also that the photographs show evidence of continuous spectrum in other parts of the nebula. In these respects the conclusions arrived at by Lord Rosse in his memoir (*Phil Trans. Royal Society*, June 20, 1867, p. 70) are to a certain extent borne out.

The hydrogen line near G, wave-length 4340, is strong and sharply defined; that at *h*, wave-length 4101, is more delicate, and there are faint traces of other lines in the violet. Among these lines there is one point of difference, especially well shown in a photograph where the slit was placed in a north and south direction across the trapezium; the H γ line, λ 4340, is of the same length as the slit, and where it intersects the spectrum of the trapezium stars, a duplication of effect is visible. If this is not due to flickering motion in the atmosphere, it would indicate that hydrogen gas was present even between the eye and the trapezium. I think the same is true of the H δ line, λ 4101. But in the case of two other faint lines in this vicinity, I think the lines are not of the length of the slit, one being quite short and the other discontinuous. If this observation should be confirmed by future photographs of greater strength, it might point to a non-homogeneous constitution of the nebula, though differences of intrinsic brightness would require to be eliminated.

The April number of the *American Journal of Science* contains an account of a photograph of the spectrum of this nebula taken by Dr. Huggins. I have not found the line at λ 3730, of which he speaks, though I have other lines which he does not appear to have photographed. This may be due to the fact that he had placed his slit on a different region of the nebula, or to his employment of a reflector and Iceland spar prism, or to the use of a different sensitive preparation. Nevertheless, my reference spectrum extends beyond the region in question.

As illustrating the delicacy of working required in this research, it may be mentioned that in one of these photo-

graphs the spectrum of a star of the tenth magnitude is easily discerned. It is only a short time since it was considered a feat to get the image of a ninth magnitude star, and now the light of a star of one magnitude less may be photographed, even when dispersed into a spectrum.

EPHING FOREST

ON Saturday last, May 6, the Queen declared free to the public the 5600 acres of open land to the north-east of London, known as Epping Forest. The history of the rescue of this magnificent tract, so long the favourite resort of London naturalists, has been told many times since the Corporation of London took up the question, and by their well-directed efforts not only checked the encroachment of rapacious land-owners, but restored to the people about 1000 acres of forest land that had been illegally inclosed. The total cost of this philanthropic movement may be estimated at nearly half a million of money, and the Corporation has deservedly earned the gratitude of all Londoners, and more especially of those lovers of nature who have for long been in the habit of regarding the Forest as a preserve from which they could obtain materials for their studies. It is a common complaint with our natural history students, that the open spaces around London are gradually being destroyed as the pressure of population necessitates increase of buildings in the suburbs, so that the preservation of this large area is really a matter of considerable scientific importance, and as such will be regarded with satisfaction by the readers of NATURE. Fortunately for naturalists, the Act of Parliament declares that the woodland tract under consideration shall be kept as far as possible "in its natural aspect." There has thus been secured to the public at large, and to the metropolitan field naturalists, a recreation-ground of a quite peculiar character, and one which will be looked upon as a great boon by botanists, zoologists, and microscopists.

The value of Epping Forest, from our point of view, lies chiefly in its wildness; by far the greater portion is primitive woodland, which has been but little interfered with by man in comparison with the heaths and commons to the north, west, and south of London. Such an expanse requires little in the way of "improvement." The Conservators have acquired a power of dealing with one of the few surviving remnants of primæval Britain, and in the interests of that continually increasing class of the public who devote themselves to the various branches of out-door natural history, it is to be hoped that this authority will be exerted judiciously. We are disposed to believe that the requirements of the ordinary holiday-maker and of the field naturalist are in this case identical. To be able to roam through many miles of wild forest is as truly a pleasure and novelty to the former as it is a necessity to the latter. From whichever side we view the question of the conservation of the forest, any attempts to destroy its natural features cannot but be deprecated, and in view of the fate of so many of the open spaces round London, this position cannot be too strongly emphasised by those to whom the preservation of our rapidly-disappearing natural history resorts is a matter of importance.

The problem of managing a tract of country which consists of a large proportion of primitive forest and a smaller proportion of land formerly under cultivation, so as to comply with the conditions of the Act and with the requirements of all classes of the public, is not so difficult as might appear at first sight. It is not as though the interests of field-naturalists in any way clashed with those of the general public. We have here a wide expanse *pro delectatione populi*, which is to be distinguished and to be kept distinct from all other public spaces in the vicinity of the metropolis by virtue of its forestal wildness,

and in order to maintain it in its "natural" condition it would have been better if the Conservators had taken counsel with some of the numerous scientific societies of London which are representative of the various classes of natural history students and investigators. This is indeed the only point—but it is a serious one—on which we feel compelled to express our disappointment at the line of management taken up by the Conservators. The Epping Forest Committee consists of twelve members of the Corporation and four Verderers chosen septennially by the commoners of the Forest parishes. Now a Committee appointed to deal with a scientific question—and as such we regard the management of a forest—cannot altogether ignore the claims of natural history without incurring the risk of having their proceedings compared with the tragedy of Hamlet with the Prince of Denmark left out. The present Verderers are Sir T. Fowell Buxton, Mr. E. N. Buxton, the Chairman of the London School Board, Mr. Andrew Johnston, late High Sheriff of Essex, and Mr. D. J. Morgan. The names of these gentlemen encourage us to think that it is no fault of theirs if the claims of natural history science are altogether ignored.

How to deal with those waste stretches of land formerly under cultivation is a question quite distinct from the management of the wooded portions of the forest. While for the latter a minimum of interference would in our opinion be most in accordance with the views of all parties, there are ample opportunities of "landscape gardening" the former. In face of this fact it is somewhat surprising that the energies of the Conservators should thus far have been chiefly directed to alterations in the *natural* portions of the area under their charge, and we are glad to see that the Essex Naturalist's Field Club has taken the initiative in inviting the co-operation of all natural history students interested in the preservation of open spaces in their natural condition, in signing a protest against the destruction of the natural features of Epping Forest. The form of petition has been forwarded to all the scientific societies of London most concerned in this question, and has already received many influential signatures. If the dedication ceremony of last Saturday makes the freeing of the Forest an event in the history of this country, it seems but just that in a period pre-eminently distinguished for its scientific culture, the naturalists of London should urge their claims ere it be too late.

R. M.

THE WINTER OF 1881-2

THE fine winter months of 1881-2, from November to March, have been characterised by a mildness rarely equalled in our British climate. Nowhere in the British Islands, from Scilly to Shetland, or from Dover to Valentia, was the mean excess above the normals of the temperature of these five months less than 2°o . This was the excess in the south of England; in central districts, such as Oxford and York, it rose to 3°o ; and the excess increased on advancing northward till it reached 4°o in the upper districts of the Tweed, Clyde, Tay, and Dee, and at Culloden, and Lairg. Everywhere on the coasts the temperature was from half a degree to a degree, relatively lower than in strictly inland situations.

In Scotland the mean temperature of each of the months exceeded its normal, except in a very few localities in December, when temperature was slightly under the average. Each of the other months had a temperature from 2°o to 6°o above the normal. In England, on the other hand, the temperature of January was pretty generally under the average, the deficiency amounting in some cases, as at Spurnhead, to nearly 2°o ; and in the central districts of Ireland the deficiency was even greater. In February, in a few districts of England, temperature fell

slightly below the normal, whereas, over large districts of Scotland, in the same month, it rose to at least 5°o above the normal.

As regards atmospheric pressure, its geographical distribution during these months was strikingly abnormal. In each month, as regards departures from the normals, there was an excess in the south, whereas in the north there was a deficiency, or if there was an excess at all, it was much less than in the south. The averages of the five months give an excess above the normal of 0°188 inch at Torquay, and 0°171 inch at Greenwich; 0°116 inch at Llandudno; 0°063 inch at Lissan, Tyrone, and 0°088 inch at Sillloth; 0°023 inch at Islay, and 0°061 inch in East Lothian; 0°011 inch at Monach, Outer Hebrides, and 0°045 inch at Aberdeen; but a deficiency from the normal of 0°019 inch at Kirkwall, 0°048 inch at North Unst, and 0°103 inch in Farö. It was to this unprecedentedly steep barometric gradient from south-east to north-west from the normals of these winter months, and the equally unprecedented predominance and force of south-westerly winds which resulted therefrom, that we owe the remarkable mildness of last winter. The extraordinarily high pressures which so frequently ruled on the Continent during the winter, and the all but rainless weather which accompanied these anti-cyclones, and the low state of many of the rivers on the one hand, and on the other the almost unbroken succession of storms which swept the Atlantic with their low pressures and destructive tempests of wind, may be pointed to as the outstanding features of the great atmospheric disturbance which has signalised the winter of 1881-82, of which the mildness of the weather in the British islands was merely an accompaniment.

If the winters of the north-east of Scotland, from which there are temperature observations since 1764, be examined, it is seen that the mean temperature of the five months from November to March have been 2°o , or more, above the normal during eighteen winters. These winters, with the amounts of the excess above the normal, are given in the following table, to which is added the excess or deficiency from the normals of each of the six summer months immediately following:—

Winters.	Excess above the normal.	April.	May.	June.	July.	Aug.	Sept.	Mean of six months.
1772-73	+2°0	+1°2	-1°4	-0°7	-1°5	+1°4	-1°2	-0°4
1777-78	+2°0	-0°2	+3°8	+4°4	+3°6	+1°8	-1°2	+2°0
1778-79	+5°2	+2°9	+1°7	+3°4	+7°4	+6°8	+3°5	+4°3
1780-81	+2°0	+3°5	+2°6	+5°1	+1°4	+0°0	-1°1	+1°9
1789-90	+4°2	-2°0	+1°2	-1°2	-3°3	0°2	-3°3	-1°5
1793-94	+3°6	+4°2	-0°7	+2°6	+3°6	8	+0°5	+1°6
1795-96	+2°3	+7°9	-0°9	-1°3	-3°5	+0°5	-0°2	+0°4
1827-28	+2°7	+0°6	+1°5	+1°8	-0°5	0°2	+1°7	+0°8
1831-32	+2°5	+1°2	-1°0	+0°8	-0°4	+0°2	+1°3	+0°4
1833-34	+3°2	+0°5	+2°6	+1°8	+1°2	+1°2	+1°2	+1°4
1834-35	+2°4	+0°0	-0°7	-0°8	-0°5	+1°9	-0°6	-0°1
1843-44	+3°8	+5°1	-0°9	-0°0	-1°2	1°6	+0°4	+0°3
1845-46	+4°1	+0°1	+3°5	+6°5	+1°3	+2°7	+6°5	+3°4
1848-49	+2°3	-1°9	+1°3	-2°2	-1°3	0°2	-0°4	-0°8
1850-51	+2°1	-1°4	+0°2	-0°9	-1°3	0°7	-0°4	-0°7
1857-58	+2°8	+0°1	-0°3	+4°4	-2°8	+1°2	+0°8	+0°6
1868-69	+2°2	+2°5	-4°5	-2°0	+1°7	0°9	+0°5	-0°5
1881-82	+4°1							
Means ...	+3°0	+1°4	+0°5	+1°3	+0°2	+0°8	+0°5	+0°8

Thus, so far as the north-east of Scotland is concerned,